Please add Claim 62 as follows:

62. (New) The method of Claim 61, wherein the heavy metals are selected from the group consisting of Ca, Cd, Cp, Cu, Fe, Hg, Mn,Ru, St, Zn and Pb.

REMARKS

In reply to the Office Action dated August 13, 2002, Applicants have amended the application as set forth above. Claims 10, 11, 18, 25, 27-28, 35, 49, 53-54 and 57-58 have been canceled. Claims 1, 3, 7-9, 12, 13, 24, 29-34, 36-41, 48, 50-52, 55, 56 and 59-61 have been amended. Upon the entry of the amendments, Claims 1-9, 12-17, 19-24, 26, 29-34, 36-48, 50-52, 55, 56 and 59-62 are pending in this application. No new matter is added by the amendments as discussed below. Applicants respectfully request the entry of the amendments and reconsideration of the application in view of the amendments and the remarks set forth below.

Discussion of Amendments

Claims 1, 3, 7-9, 12, 13, 24, 29-34, 36-41, 48, 50-52, 55, 56 and 59-61 have been amended to provide the unit of the measure for the molecular weight, Dalton or Da. Support for the amendments to these claims can be found in, for example, the specification at page 7, lines 19-23. Claims 30-32 and 38-40 have been amended to provide the unit of the measure for the viscosity, Centipoise or CP. "An amendment to correct an obvious error does not constitute new matter where one skilled in the art would not only recognize the existence of error in the specification, but also the appropriate correction." *See* M.P.E.P. 2163.07, II. The present specification does not provide the unit for the viscosity. However, the amendments to provide the unit of CP is correction of an obvious error because CP is a usual unit for viscosity of a substance and further because, for example in Claim 30, the isolated polymannuronate dissolved in water at a concentration of 2 % (w/v) will have a viscosity in the recited range in the unit of centipoise (CP). As such, the claim amendments to provide the units of measure for the molecular weight and viscosity do not constitute the addition of new matter.

Claim 1 has been further amended to incorporate the limitations of its dependent Claims 10-11. Claim 12 has been further amended to incorporate the limitations of Claims 1 and 10, which

are its base and intervening claims. Claims 24, 33, 41, 51 and 56 have been further amended to define the molecular weight of the polymannuronate from about 40,000 Da to about 80,000 Da. The lower limit of about 40,000 Da and the upper limit of about 80,000 Da are supported by the specification at, for example, page 4, line 20. Claim 34 has been amended to incorporate the limitation relating to purity of polymannuronate, which is supported by the specification at, for example, page 4, line 21. Claim 38 has been amended to incorporate the limitations of its base Claim 33. Claim 48 has been amended to incorporate the limitations deleted from Claim 41. Claims 13, 39 and 40 have been amended to change their dependency in light of the instant amendments. Claim 61 has been further amended to include "polygluronate," which is supported, for example, in Example 4 on pages 28-30 of the present specification. New Claim 62 is supported, for example, in the Example 4 and Table 15 at page 28 of the specification. In view of the foregoing discussion of the supports for the amendments, no new matter has been added by the amendments to the claims.

The specific changes to the claims are shown on a separate set of pages, including unamended claims, attached hereto and entitled **VERSION WITH MARKINGS TO SHOW CHANGES MADE**, which follows the signature page of this Amendment. On this set of pages, the insertions are underlined while the deletions are ~~stricken through~~.

Foreign Priority Claim and Submission of Priority Document

Applicants respectfully note the Examiner acknowledgement of the foreign priority under 35 U.S.C. § 119(b) or based on Korean Patent Application Nos. 2000/5294 and 2000/83853. Applicants herewith submit certified copies of the priority documents.

The Examiner indicates that the priority claim based on PCT/KR01/00139 was made under 35 U.S.C. § 119(b) and that a certified copy of the application has not been filed. However, Applicants respectfully submit that the priority claim based on International Application No. PCT/KR01/00139 was made under 35 U.S.C. § 120 or 365(c), not under § 119(b). *See* the inventors' Declaration filed December 21, 2001 and the very first paragraph of the present specification. The International Application was filed in English and published as noted in the first paragraph of the specification of the present application. Applicants respectfully submit that a certified copy of the International Application filed in English is not

required under 35 U.S.C. § 365(c).

Information Disclosure Statement

The Examiner notes that the previously submitted references titled "Effect of pH Drug Release Form Polysaccharide Stirred Cell" and "A Cardiovascular Support System Containing Potent Antioxidants" were in illegible condition. In reply, Applicants resubmit these references along with a few additional references with an Information Disclosure Statement that accompanies this Response.

Discussion of Rejection Under 35 U.S.C. § 112, First Paragraph

Claims 56-60 have been rejected under 35 U.S.C. § 112, first paragraph, as lacking enablement. Noting that Claims 56-60 are drawn to prevention of hyperlipidemia, obesity and diabetes, the Examiner asserts that undue experimentation would be required to make or use the full scope of the claimed invention, referring to various factors set out in *In re Wands*, 858 F.2d. 731, 737, 8 U.S.P.Q. 2d 1400, 1404 (Fed. Cir. 1988). In the analysis of the factors, the Examiner correctly notes that the present application provides sufficient data and information for the treatment of obesity and diabetes. Applicants respectfully disagree with the Examiner's assertion of lack of enablement with regard to the prevention of hyperlipidemia, obesity and diabetes. Applicants respectfully submit that the disclosure of the present application is sufficient for the ordinary skill in the art to make or use the claimed invention of preventing hyperlipidemia, obesity and diabetes as well as the treatment of such diseases.

In order to expedite the prosecution, however, Applicants have amended Claim 56, without prejudice, to clarify the invention drawn to method of treatment of, among other things, hyperlipidemia, obesity and diabetes, excluding prevention of such diseases. Amended Claims 56-60 are no longer drawn to the prevention of hyperlipidemia, obesity and diabetes. In view of the amendment, Applicants respectfully submit that the rejection of these claims is moot. Withdrawal of the rejection is respectfully requested.

Discussion of Rejection Under 35 U.S.C. § 112, Second Paragraph

Claims 1-61 have been rejected under 35 U.S.C. § 112, second paragraph, as being

indefinite. The Examiner contends that Claims 1, 3, 7-9, 25, 27-29, 33-36, 41, 48-51, 53-59 and 61 do not recite a unit of measure for the recited molecular weights. Also, the Examiner contends that Claims 30-32 and 38-40 lack a unit of the recited viscosity. The Examiner requested the addition of the units to the claims. In reply, Applicants have amended these claims to provide the unit of "Dalton" (Da) for the molecular weights and the unit of "centipoise" (CP) for the viscosity. In view of the amendments, Claims 1-61 are believed to be definite. Applicants respectfully request withdrawal of the rejection.

Discussion of Rejection Under 35 U.S.C. § 103(a)

Claims 1-11, 13-29, 33-37, 51-61 have been rejected under 35 U.S.C. § 103 (a) as being unpatentable over Eliaz *et al.* (U.S. Patent No. 6,274,566) in view of Dorian *et al.* (U.S. Patent No. 5,639,467). Claims 41-50 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Eliaz et al and Dorian *et al.* in further view of Iwata *et al.* (U.S. Patent No. 5,324,526). However, Applicants respectfully submit that the presently claimed invention is patentable over the cited references as discussed below.

Discussion of Patentability of Claims 24, 33, 41, 51 and the Dependent Claims Thereof

Claims 24, 33, 41 and 51 have been amended to include the feature of "polymannuronate's molecular weight range from about 40,000 Da to about 80,000 Da." The Patent and Trademark Office has the burden under section 103 to establish a prima facie case of obviousness. *In re Piasecki*, 745 F.2d 1468, 1471-72, 223 USPQ 785, 787-87 (Fed. Cir. 1984). In order to provide a *prima facie* showing of obviousness, the Patent and Trademark Office has the burden to provide teaching or suggestion to create the claimed invention. *See, e.g., In re Fine*, 837 F.2d 1071, 1074 (Fed. Cir. 1988). In the case of the presently claimed invention, nothing in the cited prior art would provide such teaching or suggestion.

Eliaz *et al.* teaches reduction of molecular weight of alginate to 40,000 Da or less with use of alkaline or enzyme (column 1, lines 54-57). Eliaz *et al.* also teaches the molecular-weight reduced alginate's association with reduction of cholesterol in soft drinks (column 2, lines 5-6). Eliaz *et al.*notes that the alginate are a mixture of polymannuronic acid and polygluronic acid (column 1, lines 48-50). But, Eliaz *et al.* is completely silent about the "specific molecular

weight range" of "polymannuronate" as in the presently claimed invention.

Dorian *et al.* teaches hydrolysis of alginate with use of a diluted HCl solution (column 6, lines 56-61) and adjustment of relative amounts of mannuronate and gluronate in the mixture thereof with use of an acid solution of about pH 1.5-2.5 (column 7, lines 1-35). Dorian *et al.* states that it is possible to obtain specific relative amounts of mannuronate and gluronate (column 7, lines 36-45). Dorian *et al.* teaches preferable molecular weight ranges of "alginate" for the purpose of coating in the ranges of 2-300 kDa, 4-250 kDa or 6-120 kDa (column 6, lines 53-56). However, Dorian *et al.* does not teach or suggest the "specific molecular weight range" of "polymannuronate" as in Claims 24, 33, 41 and 51.

Itawa *et al.* teaches an algin-containing beverage with an average molecular weight of the "algin" in the range of 10,000-900,000 Da. Itawa *et al.* does not teach or suggest the "specific molecular weigh range" of "polymannuronate" either.

As discussed above, the cited references do not provide appropriate teaching or suggestion of "polymannuronate with a molecular weight from about 40,000 Da to about 80,000 Da." Absent such teaching or suggestion, the cited references do not establish a *prima facie* case of obviousness. As such, Applicants respectfully submit that Claims 24, 33, 41, 51 and their dependent claims are patentable over the cited references.

Moreover, the presently claimed invention is patentable in view of unexpected results evidenced by polymannuronate having a molecular weight range from about 40,000 Da to about 80,000 Da as set forth in the accompanying Declaration by Dr. Dong Soo Lee. Dr. Lee conducted comparative experimentation of producing polymannuronate compositions of different molecular weights and tested the cholesterol binding capability of these polymannuronate compositions. The polymannuronate recited in the presently pending claims has up to about 197 % (69/35) of cholesterol binding capability over the polymannuronates with other molecular weights. At a minimun, the presently claimed polymannuronate has about 138 % (62/45) of cholesterol binding capability over the polymannuronates with other molecular weights. As such, the cholesterol binding capability of the presently claimed invention is substantially higher than that of polymannuronates with other molecular weights.

It would have been unexpected to one of ordinary skill in the art that the polymannuronate having a molecular weight from about 40,000 Da to about 80,000 Da has such

a substantially higher cholesterol binding capability than other polymannuronate of different molecular weight ranges. In view of the unexpected results, Claims 24, 33, 41, 51 and the dependent claims thereof, reciting polymannuronate with a molecular weight from about 40,000 Da to about 80,000 Da, are patentable over the cited references. Withdrawal of the rejection of these claims is respectfully requested.

Patentability of Claim 1 and its Dependent Claims

Claim 1 has been amended to incorporate the limitations of Claims 10-11 to clarify the claimed method. As amended, Claim 1 recites the features that the hydrolysis comprises adding one or more organic acids to the alginates and heating the mixture of alginate and the organic acid, and that the organic acid is selected from the group consisting of citric acid, malic acid, oxalic acid, lactic acid, succinic acid, tartaric acid and acetic acid.

As noted above, Eliaz *et al.* teaches use of alkaline or enzyme in reducing molecular weight of alginate. However, Eliaz *et al.* is silent about use of an organic acid in the reduction of molecular weight of alginate. Dorian *et al.* was relied on to remedy a deficiency of Eliaz *et al.*, which is isolation of polymannuronate from the molecular weight-reduced alginate. Regardless, Dorian *et al.* does not teach the use of an organic acid in the reduction of molecular weight of alginate. Dorian *et al.* only teaches the use of a diluted HCl solution. As such, Dorian *et al.* does not remedy the deficiency of Eliaz *et al.* relating to the use of an organic acid. Overall, the two references do not provide any teaching or suggestion about the use of one or more organic acids in hydrolysis of alginate or algin, nor in particular any of the specified organic acids. Absent such teaching or suggestion, the references do not establish an appropriate *prima facie* case of obviousness.

Moreover, the use of one or more recited organic acids provides a substantial benefit over the hydrolysis of alginate using HCl as in Dorian *et al.* The use of the specific organic acids eliminates the process for removing substances harmful to human body. Because the polymannuronate compositions prepared according to the present invention are used in food, drugs or nutritional aid products, any materials harmful to human body need to be removed after preparation of the composition. It is generally understood that the hydrolysis using any of the specified organic acids would not generate harmful substances. In Dorian *et al.*, on the other

hand, the result of the HCl hydrolysis would necessarily generate some harmful substances like chlorine and inorganic salts, which are not compatible with food, drugs or nutritional aids and therefore need to be removed. Thus, the hydrolysis of alginate using the recited organic acids has benefits over the hydrolysis of alginate using HCl taught in Dorian *et al.*

The benefit of elimination of the inorganic salts removal step is substantial because the costs involved in removing chlorine and inorganic salts are significant. Normally, removal of chlorine and inorganic salts requires ultrafiltration (UF) or nanofiltration (NF) using membranes having pores with molecular weight cut-offs less than 10,000 Daltons. Such filtration equipment and filter membranes are expensive. Filtration equipment itself costs $100,000-$200,000. In addition to the equipment, replacement filter membranes that needs to be replaced as needed are about 30% of the cost of the equipment. What is worse is that, in the case of filtering polymannuronate, because of the high viscous of the material, life of the replacement membranes are significantly shorter than using non-viscous materials. As a result, the inorganic salt removal step would considerably increase the operation costs for the preparation of polymannuronate compositions. In view of the costs involved in the removal of harmful substances, the use of the organic acid for the hydrolysis of alginate provides substantial benefits over the use of HCl as in Dorian *et al.*

The substantial benefit of the presently claimed method over the teaching of Dorian *et al.* provides an additional ground for the patentability of Claim 1 and its dependent claims. Withdrawal of the rejection is respectfully requested.

Discussion of Patentability of Claim 61

Claim 61 is directed to a method of expelling heavy metals from a body. However, the references (Eliaz *et al.* and Dorian *et al*) relied on rejecting Claim 61 neither teaches nor suggests the use of the polymannuronate or polygluronate composition in expelling heavy metals from a body. Absent any such teaching or suggestion, the references do not establish an appropriate *prima facie* case of obviousness. Applicants respectfully submit that Claim 61 and its dependent Claim 62 are patentable over the references. Withdrawal of the rejection of Claim 61 is respectfully requested.

Patentability of Claims 12, 30-32 and 38-40

Claims 12, 30-32 and 38-40 have been rejected only under 35 U.S.C. § 112. Applicants have addressed the rejection of these claims by the claim amendments of providing units of measurement of the molecular weight and/or viscosity. Further, the above amendments to Claims 12, 30 and 38 put them in independent form, and Claims 31-32 and 39-40 have been amended to depend from Claim 30 or 28. Thus, Claims 12, 30-32 and 38-40 are no longer objectionable for depending on previously rejected claims. Applicants respectfully submit that Claims 12, 30-32 and 38-40 are in condition for allowance.

CONCLUSION

In view of Applicants' amendments to the claims and the foregoing remarks, it is respectfully submitted that the present application is in condition for allowance. Should the Examiner have any remaining concerns, which might prevent the prompt allowance of the application, the Examiner is respectfully invited to contact the undersigned at the telephone number appearing below.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: 2/13/03

By: 

Mincheol Kim
Registration No. 51,306
Agent of Record
Customer No. 20,995
(619) 235-8550

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 10, 11, 18, 25, 27, 28, 35, 49, 53, 54, 57 and 58 have been canceled. Claims 1, 3, 7-9, 12, 13, 24, 29-34, 36-41, 50-52, 55, 56 and 59-61 have been amended, and Claim 62 has been added as follows:

1. (Amended) A method of preparing a polymannuronate composition, comprising:

providing alginate;

hydrolyzing the alginate to form a mixture comprising polymannuronate and polyguluronate, wherein the polymannuronate has a molecular weight ranged from about 4,000 Dalton (Da) to about 500,000 Da, wherein the hydrolysis comprises adding one or more organic acids to the alginate and heating the mixture of the alginate and the organic acid, and wherein the organic acid is selected from the group consisting of citric acid, malic acid, oxalic acid, lactic acid, succinic acid, tartaric acid and acetic acid; and

isolating the polymannuronate from the mixture.

2. The method of Claim 1, wherein the providing the alginate comprises extracting the alginate from marine algae.

3. (Amended) The method of Claim 1, wherein the alginate has a molecular weight from about 2,000,000 Da to about 4,000,000 Da.

4. The method of Claim 1, wherein the hydrolysis is carried out for about 20 minutes to about 3 hours.

5. The method of Claim 1, wherein the hydrolysis is carried out for about 40 minutes to about 2 hours.

6. The method of Claim 1, wherein the hydrolysis is carried out for about 1 hour to about 1.5 hours.

7. (Amended) The method of Claim 1, wherein the polymannuronate has a molecular weight from about 10,000 Da to about 100,000 Da.

8. (Amended) The method of Claim 1, wherein the polymannuronate has a molecular weight from about 25,000 Da to about 80,000 Da.

9. (Amended) The method of Claim 1, wherein the polymannuronate has a molecular weight from about 40,000 Da to about 50,000 Da.

10. (Canceled) ~~The method of Claim 1, wherein the hydrolysis comprises adding one or more organic acids to the alginate and heating the mixture of the alginate and the organic acid.~~

11. (Canceled) ~~The method of Claim 10, wherein the organic acid is selected from the group consisting of citric acid, malic acid, oxalic acid, lactic acid, succinic acid, tartaric acid and acetic acid.~~

12. (Amended) The method of preparing a polymannuronate composition, comprising:~~Claim 10~~

providing alginate;

hydrolyzing the alginate to form a mixture comprising polymannuronate and polyguluronate, wherein the polymannuronate has a molecular weight ranged from about 4,000 Da to about 500,000 Da;

isolating the polymannuronate from the mixture; and

wherein the hydrolysis comprises adding one or more organic acids including acetic acid to the alginate and heating the mixture of the alginate and the organic acid, wherein the organic acid is acetic acid.

13. (Amended) The method of Claim ~~10~~1, wherein the concentration of the organic acid is from about 0.2 M to about 0.6 M.

14. The method of Claim 1, wherein the isolation of polymannuronate comprises adjusting pH of the mixture.

15. The method of Claim 14, wherein the pH of the mixture is adjusted to a range from about 2.5 to about 3.5.

16. The method of Claim 14, wherein the pH of the mixture is adjusted to a range from about 2.8 to about 3.0.

17. The method of Claim 14, wherein the pH adjustment is carried out by adding one or more acids.

18. (Canceled) ~~The method of Claim 17, wherein the acid is an organic acid.~~

19. The method of Claim 1, wherein the isolation of polymannuronate comprises forming a precipitate in the mixture and collecting a supernatant, in which the polymannuronate is dissolved.

20. The method of Claim 19, wherein the isolation further comprises precipitating the polymannuronate from the collected supernatant.

21. The method of Claim 1, wherein the isolation of polymannuronate isolates the polymannuronate with a purity from about 70 wt.% to about 98 wt.%.

22. The method of Claim 1, wherein the isolation of polymannuronate isolates the polymannuronate with a purity from about 80 wt.% to about 97 wt.%.

23. The method of Claim 1, wherein the isolation of polymannuronate isolates the polymannuronate with a purity from about 90 wt.% to about 95 wt.%.

24. (Amended) A polymannuronate composition prepared by the method of Claim 1, wherein the composition comprises polymannuronate with a molecular weight from about 40,000 Da to about 80,000 Da.

25. (Canceled) ~~The polymannuronate composition of Claim 24, wherein the composition comprising polymannuronate with a molecular weight ranged from about 4,000 to about 500,000.~~

26. The polymannuronate composition of Claim 25, wherein the polymannuronate in the composition has a concentration from about 70 wt.% to about 98 wt.%.

27. (Canceled) ~~The polymannuronate composition of Claim 24, wherein the composition comprising polymannuronate with a molecular weight ranged from about 10,000 to about 100,000.~~

28. (Canceled) ~~The polymannuronate composition of Claim 24, wherein the composition comprising polymannuronate with a molecular weight ranged from about 25,000 to about 80,000.~~

29. (Amended) The polymannuronate composition of Claim 24, wherein the composition comprising polymannuronate with a molecular weight ranged from about 40,000 Da to about 50,000 Da.

30. (Amended) The polymannuronate composition ~~of Claim 24~~prepared by the method of Claim 1, wherein the isolated polymannuronate dissolved in water at a concentration of 2 % (w/v) has a viscosity from about 1.25 centipoise (CP) to about 15 CP at 25 °C.

31. (Amended) The polymannuronate composition of Claim ~~24~~30, wherein the isolated polymannuronate dissolved in water at a concentration of 2 % (w/v) has a viscosity from about 2 CP to about 10 CP at 25 °C.

32. (Amended) The polymannuronate composition of Claim ~~24~~30, wherein the isolated polymannuronate dissolved in water at a concentration of 2 % (w/v) has a viscosity from about 3 CP to about 7 CP at 25 °C.

33. (Amended) Substantially i~~I~~solated polymannuronate having a molecular weight ranged from about 40,000 Da~~4,000~~ to about 80,000 Da~~500,000 with a purity from about 70 wt.% to about 98 wt.%~~.

34. (Amended) The isolated polymannuronate of Claim 33, wherein the polymannuronate has ~~a molecular weight from about 10,000 to about 100,000~~a purity from about 70 wt.% to about 98 wt.%.

35. (Canceled) ~~The isolated polymannuronate of Claim 33, wherein the polymannuronate has a molecular weight from about 25,000 to about 80,000.~~

36. (Amended) The isolated polymannuronate of Claim 33, wherein the polymannuronate has a molecular weight from about 40,000 Da to about 50,000 Da.

37. (Amended) The isolated polymannuronate of Claim ~~33~~34, wherein the purity is from about 80 wt.% to about 97 wt.%.

38. (Amended) The isolated polymannuronate ~~of Claim 33~~having a molecular weight ranged from about 4,000 Da to about 500,000 Da with a purity from about 70 wt.% to about 98 wt.%, ~~wherein~~ wherein the isolated polymannuronate dissolved in water at a concentration of 2 % (w/v) has a viscosity from about 1.25 CP to about 15 CP at 25 °C.

39. (Amended) The isolated polymannuronate of Claim ~~33~~38, wherein wherein the isolated polymannuronate dissolved in water at a concentration of 2 % (w/v) has a viscosity from about 2 CP to about 10 CP at 25 °C.

40. (Amended) The isolated polymannuronate of Claim ~~33~~38, wherein the isolated polymannuronate dissolved in water at a concentration of 2 % (w/v) has a viscosity from about 3 CP to about 7 CP at 25 °C.

41. (Amended) A nutritional composition comprising a foodstuff and polymannuronate having a molecular weight from about 40,000 Da~~4,000~~ to about 80,000 Da~~500,000, wherein in case the nutritional composition comprises polyguluronate, the polyguluronate is in an amount less than about 30 wt.% of the total weight of the polymannuronate and polyguluronate~~.

42. The nutritional composition of Claim 41, wherein the polyguluronate is in an amount less than about 15 wt.% of the total weight of the polymannuronate and polyguluronate.

43. The nutritional composition of Claim 41, wherein the polyguluronate is in an amount less than about 10 wt.% of the total weight of the polymannuronate and polyguluronate.

44. The nutritional composition of Claim 41, wherein the polymannuronate is in an amount from about 0.00001 wt.% to about 50 wt.%.

45. The nutritional composition of Claim 41, wherein the polymannuronate is in an amount from about 0.0001 wt.% to about 15 wt.%.

46. The nutritional composition of Claim 41, wherein the foodstuff is in a liquid or solid form.

47. The nutritional composition of Claim 41, wherein the foodstuff is selected from the group consisting of beverages, margarine, hams and noodles.

48. (Amended) The nutritional composition of Claim 41, wherein in the event that the nutritional composition additionally comprises polyguluronate, the polyguluronate is in an amount less than about 30 wt.% of the total weight of the polymannuronate and polyguluronate~~the polymannuronate has a molecular weight from about 10,000 to about 100,000~~.

49. (Canceled) ~~The nutritional composition of Claim 41, wherein the polymannuronate has a molecular weight from about 25,000 to about 80,000.~~

50. (Amended) The nutritional composition of Claim 41, wherein the polymannuronate has a molecular weight from about 40,000 Da to about 50,000 Da.

51. (Amended) A pharmaceutical composition comprising polymannuronate and a pharmaceutical carrier, wherein the polymannuronate has a molecular weight from about 40,000 Da~~4,000~~ to about 80,000 Da~~500,000~~.

52. (Amended) The pharmaceutical composition of Claim 51, wherein in the event that~~ease~~ the pharmaceutical composition additionally comprises polyguluronate, the polyguluronate is in an amount less than about 30 wt.% of the total weight of the polymannuronate and polyguluronate.

53. (Canceled) ~~The pharmaceutical composition of Claim 51, wherein the polymannuronate has a molecular weight ranged from about 10,000 to about 100,000.~~

54. (Canceled) ~~The pharmaceutical composition of Claim 51, wherein the polymannuronate has a molecular weight ranged from about 25,000 to about 80,000.~~

55. (Amended) The pharmaceutical composition of Claim 51, wherein the polymannuronate has a molecular weight ranged from about 40,000 Da to about 50,000 Da.

56. (Amended) A method of treatment selected from the group consisting of controlling cholesterol level in blood, controlling serum lipids, ~~preventing~~ hyperlipidemia, ~~preventing~~ obesity, ~~preventing~~ diabetes, and enhancing functions of liver, the method comprising administering a composition comprising a pharmaceutically acceptable carrier and polymannuronate having a molecular weight from about 40,000 Da~~4,000~~ to about 80,000 Da~~500,000~~ to a patient in need of such treatment.

57. (Canceled) ~~The method of Claim 56, wherein the polymannuronate has a molecular weight from about 10,000 to about 100,000.~~

58. (Canceled) ~~The method of Claim 56, wherein the polymannuronate has a molecular weight from about 25,000 to about 80,000.~~

59. (Amended) The method of Claim 56, wherein the polymannuronate has a molecular weight from about 40,000 Da to about 50,000 Da.

60. (Amended) The method of Claim 56, wherein in the event that~~ease~~ the composition additionally comprises polyguluronate, the polyguluronate is in an amount less than 30 wt.% of the total weight of the polymannuronate and polyguluronate.

61. (Amended) A~~The~~ method of expelling heavy metals from a body, comprising administering a composition comprising a pharmaceutically effective amount of

polymannuronate or polygluronate and a pharmaceutically acceptable carrier, wherein the polymannuronate has a molecular weight from about 4,000 Da to about 500,000 Da.

62. (New) The method of Claim 61, wherein the heavy metals are selected from the group consisting of Ca, Cd, Cp, Cu, Fe, Hg, Mn,Ru, St, Zn and Pb.

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